

CLAIMS

1. An article alignment method comprising:
holding an article with an article holder; and
rotating at least a portion of the article holder around an axis passing through the
5 article to rotate the article relative to the article holder while the holder is holding the
article.
2. The method of Claim 1 wherein holding the article comprises pressing the
article against the holder; and
rotating at least a portion of the article holder comprises rotating at least a portion
10 against which the article is pressed.
3. The method of Claim 2 wherein the article holder comprises one or more
openings through which one or more gas flows are emitted towards the article to attract
the article to the holder; and
the article is pressed against one or more protrusions on the holder.
- 15 4. The method of Claim 2 wherein the article is pressed against one or more
protrusions on the holder; and
the method further comprises pushing the article against one or more objects to
cause the article to slide on the one or more protrusions while the holder is holding the
article.
- 20 5. The method of Claim 1 further comprising transporting the article holder,
with the article in the holder, to a rotary drive;
wherein the rotating operation comprises coupling the drive to the article holder to
transfer a rotary motion of the drive to the article.
- 25 6. The method of Claim 5 wherein coupling the drive to the article holder
comprises coupling the drive to a rotational member of the article holder, the rotational
member physically contacting the article and coupling the rotary motion of the drive to
the article.
7. A method for article handling, the method comprising:
picking up an article with an article holder;
30 sensing, with a sensor, the article's rotational orientation relative to an axis
passing through the article, and if the rotational orientation is different from a
predetermined orientation, then rotating the article to place the article into the

predetermined orientation, wherein the sensing and rotating operations are performed while the article is held by the holder.

8. The method of Claim 7 wherein holding the article comprises pressing the article against the holder; and

5 rotating the article comprises rotating at least a portion of the article holder against which portion the article is pressed.

9. The method of Claim 8 wherein the article holder comprises one or more openings through which one or more gas vortices are emitted towards the article to develop an attraction force attracting the article to the holder; and

10 the article is pressed by the attraction force against one or more protrusions on the holder.

10. The method of Claim 8 wherein the article is pressed against one or more protrusions on the holder; and

15 the method further comprises pushing the article against one or more objects to cause the article to slide on the one or more protrusions while the holder is holding the article.

11. The method of Claim 7 further comprising transporting the article holder, with the article in the holder, to a rotary drive;

20 wherein the rotating operation comprises coupling the drive to the article holder to transfer a rotary motion of the drive to the article.

12. The method of Claim 11 wherein coupling the drive to the article holder comprises coupling the drive to a rotational member of the article holder, the rotational member physically contacting the article and coupling the rotary motion of the drive to the article.

25 13. A robot end effector comprising a member rotational relative to the end effector, to allow an article held in the end effector to rotate around an axis passing through the article.

14. The end effector of Claim 13 wherein the end effector further comprises:
a body to which the member is coupled and around which the member is

30 rotational; and

a device for pressing the article against the member when the end effector is holding the article.

15. The end effector of Claim 14 wherein the device comprises a vortex chuck to emit a gas vortex towards the article.

16. The end effector of Claim 15 wherein the vortex chuck is mounted in the body.

5 17. A robot end effector comprising a mechanism for holding an article and rotating the article around an axis passing through the end effector.

18. The end effector of Claim 17 wherein the end effector further comprises: a body to which the member is coupled and around which the member is rotational; and

10 a device for pressing the article against the member when the end effector is holding the article.

19. The end effector of Claim 17 wherein the device comprises a vortex chuck to emit a gas vortex towards the article.

15 20. The end effector of Claim 19 wherein the vortex chuck is mounted in the body.

21. A computer system programmed to control an article holder and a motor for rotating at least a portion of the article holder to perform the operations of Claim 1.

22. A computer readable medium comprising computer instructions to control an article holder and a motor for rotating at least a portion of the article holder to perform the operations of Claim 1.

20 23. A computer system programmed to control an article holder and a motor for rotating at least a portion of the article holder to perform the operations of Claim 8.

24. A computer readable medium comprising computer instructions to control an article holder and a motor for rotating at least a portion of the article holder to perform the operations of Claim 8.

25